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ABSTRACT

A synthesis of the flow theory of intrinsic motivation of Csikszentmihalyi and the motivational design theory of instruction of Keller is presented. The conceptual integration of these theories is the basis for prescriptions aimed at increasing the level of intrinsic motivation in instruction. The flow phenomenon is described in terms of challenge and skills. When these are in balance, people feel that they are able to achieve a challenging but realistic goal. Flow is perceived as a positive experience because mastery of an achievable challenge stretches capabilities by promoting the development of new skills and increasing self-esteem and personal complexity. If the flow theory is integrated into the categories of Keller's theory (effort, performance, and consequences), effort can be seen to correspond to the challenge parameter, whereas performance corresponds to skills and consequences correspond to feedback in the flow model. A literature review identifies the recommendations and prescriptions of various authors into the variables of the synthesis, which are conceptualized as challenges (incorporating goals), means (including skills), and feedback. Two figures and three tables illustrate the synthesis. (Contains 16 references.) (SLD)

Title:

Utilizing Intrinsic Motivation in the Design of Instruction

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The study of motivation has long been a neglected area in instructional technology. The emphasis on promoting effectiveness and efficiency in instructional design often excludes concerns about the appeal of instruction. Traditionally handicapped by the lack of theory and lack of measurements dealing with motivation, instructional designers have assumed that good quality instruction will in itself be motivating (Keller, 1983).

However, research in the field of intrinsic motivation over the last decade has yielded insights which can be applied to problems in instructional design. This research has resulted in the development of Flow Theory, a model which explains the structure of optimal experiences and the dynamics of intrinsic motivation.

This paper will provide a synthesis of Csikszentmihalyi's Flow Theory of intrinsic motivation with Keller's Motivational Design Theory of Instruction. The conceptual integration of these two theories will be the basis for presenting prescriptions aimed at increasing the level of intrinsic motivation in instruction.

Theoretical framework

The flow phenomenon is best described in terms of its two parameters, challenge and skills. When these two factors are in balance, people feel that they have the skills necessary to achieve a challenging, but realistic, goal (Csikszentmihalyi, 1982). A challenge is perceived as an activity that has clear goals and requires an investment of effort in order for the goal to be achieved. Skills are those efforts that an individual needs to apply towards the achievement of the goal. Implicit in this model is the characteristic of feedback, which allows an individual to track his or her efforts in achieving the goal.

Csikszentmihalyi (1993) states that flow-like activities have four main characteristics:

> (1) they have concrete goals and manageable rules, (2) they make it possible to adjust opportunities for action to our capabilities, (3) they provide clear information about how well we are doing, and (4) they screen out distractions and make concentration possible. (p. xiv)

Flow experiences are informative in nature, that is, they are clearly bounded by rules and goals, yet are flexible enough to allow an individual to exert effort and experience the results of those efforts.

The emotional effects of attempting to achieve any goal can be classified according to the ratio of challenge to skill an individual applies to the task. These ratios are termed "channels" and are grouped into classes and defined by Csikszentmihalyi & Csikszentmihalyi (1988), as: flow, in which the level of challenge is equal or slightly above the level of skill required to achieve the task; anxiety, in which the level of challenge is greater than the amount of skill necessary for the task; apathy, in which both the level of challenge and the level of skill is low; and boredom, in which the level of challenge is lower than the amount of skill an individual can bring to the task (see figure 1).

Flow is perceived as a positive experience because the mastery of an achievable challenge stretches an individual's capabilities by promoting the development of new skills and increasing self-esteem and personal complexity (Csikszentmihalyi & LeFevre, 1989). In addition, remaining in the state of flow requires further increases in the complexity of the challenge, thereby promoting growth.

While in a state of flow, people often report feeling more active, alert, concentrated, happy, satisfied, and creative (Csikszentmihalyi & LeFevre, 1989). Flow produces a sense of focused concentration described as the "merging of activity and awareness" which Csikszentmihalyi claims "produces harmony within the self" (Csikszentmihalyi & Csikszentmihalyi, 1988).

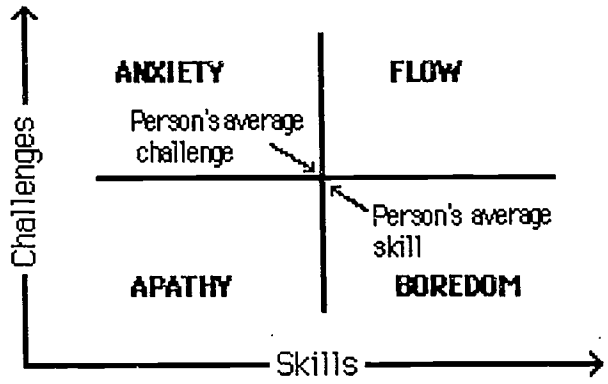

Figure 1: The "four-channel" flow model. (Adapted from Massimini and Carli, 1986, as cited in Csikszentmihalyi & Csikszentmihalyi, 1988.)

In terms of instructional design, flow theory emphasizes the importance of three design variables, goals, means and feedback. Instructional designers promote the use of instructional objectives as the backbone of the development process. The emphasis in flow theory on the importance of clear goals reinforces this basic prescription. In addition, the importance in flow theory of communicating clear means to achieve goals is the main purpose of the many instructional design theories and models that have developed in our field. And the emphasis on clear feedback in flow theory has also been an issue in instructional design since the days of Skinner and the development of programmed instruction.

These three environmental characteristics of flow provide a theoretical congruence between Csikszentmihalyi's theory and the practice of instructional design. Flow theory can provide instructional designers with a clearer understanding of the motivational aspects of instruction while also providing us with a set of criteria for evaluating the appeal of instruction.

The first, and perhaps only ID theory to explicitly address the use of motivation is John Keller's motivational design theory (Reigeluth, 1987). This theory is integrative in nature and is intended to be used in conjunction with other instructional design theories. The theory has both a descriptive component, the "Motivational Design" theory, and a prescriptive component, known as the ARCS (Attention, Relevance, Confidence, and Satisfaction) model of instructional strategies (Keller & Kopp, 1987).

In analyzing and synthesizing the research on motivation in education Keller has identified three major categories which form the backbone of his theory: effort, performance, and consequences. In addition, each of these categories has both personal and environmental factors which affect them.

This synthesis has a basic assumption: that the intrinsic motivational theory of flow should be thought of as a subset of Keller's larger theory of motivation. The goal was to incorporate flow theory within the three-categories framework of Keller's theory.

From this perspective then, Keller's category of effort corresponds to the challenge parameter of the flow model. This is based upon the assumption that an individual's amount of effort is at least partially a function of their perception of the challenge.

The performance category of Keller's theory corresponds to the skills parameter of flow, if we assume that an individual's performance is dependent upon an adequate level of

skills to meet the challenge.

Finally, the consequences category of Keller's theory would correspond to the function of feedback in the flow model. Feedback is used in the Flow model to adjust the balance of challenge and skills to create optimal experiences. Interpreted from Keller's framework, the consequences of an individual's performance functions as a feedback mechanism, therefore allowing the individual to evaluate performance and modify behavior if necessary (see figure 2).

In addition, personal and environmental factors have been derived from Flow Theory which correspond to these elements in Keller's theory.

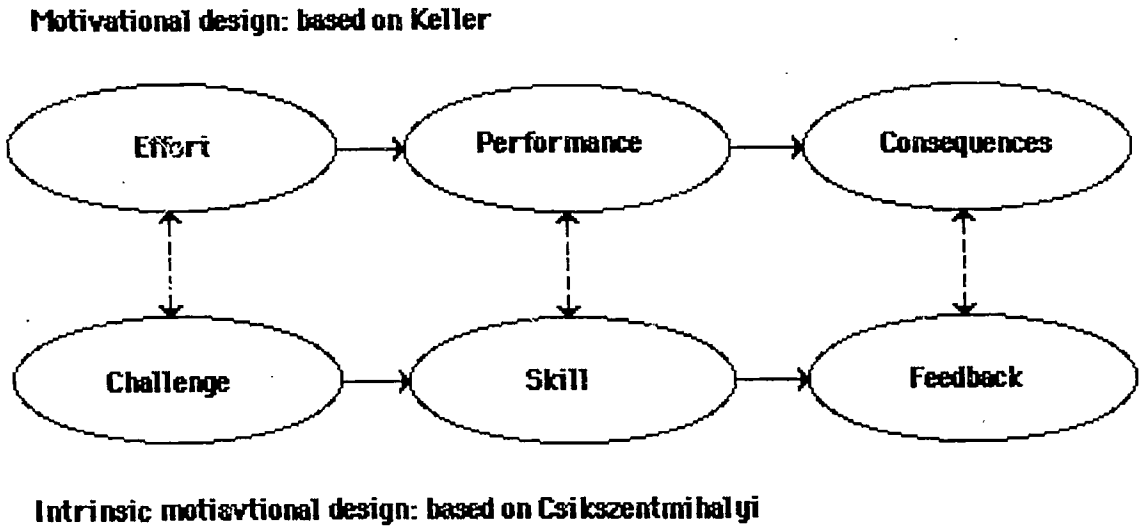

Figure 2: The conceptual fit between Keller's and Csikszentmihalyi's theories, showing intrinsic motivation as a subset of motivation

This synthesis provides a number of advantages to the instructional designer. First, it provides a unified conceptual framework for the motivational design of instruction, which not only takes advantage of the latest research in intrinsic motivation but also fits within our own conceptual frame of reference. Second, it can help clarify the issues in intrinsic motivation by defining the chief parameters and relationships within the theory. Third, as with Keller's theory, it leads to predictions about the relationships between intrinsic motivation, learning, and performance. And finally, it can be used as a basis for developing prescriptions for the design of intrinsic motivation in instruction.

Methodology

As an initial attempt to derive these prescriptions, an extensive literature review was conducted on the topic of intrinsic motivation. This literature review covered a wide variety of authors, operating from a number of theoretical viewpoints. Their recommendations were interpreted from the viewpoint of flow theory, and specific prescriptions were derived which fit into the framework of the theory.

The prescriptions are grouped into three major categories which correspond to the three variables presented in the synthesis: challenges (incorporating goals), means (including skills), and feedback.

Challenge Strategies

The first set of strategies listed under C1: "Challenges/Skills" (see table 1) are based upon Csikszentmihalyi's (1990) identification of the first major element of flow. It is important for the designer/teacher/manager to clearly identify the goals, means, and boundaries of the activity. These provide the "rules of the game" that students will be operating under. It is these very constraints that can be liberating for a learner because they reduce ambiguity and doubt. Once the challenge has been set however, learners should be given the maximum amount of freedom to explore within the boundaries of the activity. The idea is to clearly define goals and final outcomes, but not to micromanage the process for each individual.

The strategies under C2 deal with the need to design challenges that are optimal in nature, that is, activities that are difficult, but achievable by the target group (Reeve, 1992). Since individual differences may vary considerably, challenging activities should be designed with a variety of difficulty levels so that individual learners can enter them at an appropriate level. Furthermore, the activity must contain an element of accelerating difficulty to compensate for the growth in the learner's skills (Csikszentmihalyi,1990). Feedback that is directly linked to performance is another useful element in designing optimal challenges because it allows the learners to systematically judge their progress and fosters an increased sense of competence (Deci & Ryan, 1985).

Table 1: Challenge Strategies

C1. Challenge/Skills

- C1.1 Create challenging activities that require the application of of skills.
- C1.2 Clearly communicate the goals of the activity, and the rules bounding the activity.
- C1.3 Clearly communicate the means to reach the goal by identifying pre-requisite skills.

C2. Optimal Challenges

- C2.1 Create challenging activities that are optimal in nature.
- C2.2 Create activities with varying degrees of difficulty.
- C2.3 Create activities with accelerating difficulty levels.
- C2.4 Utilize clear and informative feedback to communicate performance.

C3. Goal Setting

- C3.1 Create goals for the activity which are interesting, challenging, and clearly communicated.
- C3.2 Create activities that allow for goal setting.
- C3.3 Utilize short-term goals for individuals whose initial intrinsic motivation is low.
- C3.4 Utilize long-term goals for individuals whose initial intrinsic

motivation is high.

Goal setting is the concern of the strategies listed under C3. Within the boundaries of the activity, personal goal setting should be encouraged. However, guidance as to the type of goals should be provided based upon the learner's initial level of intrinsic motivation (Vallerand et al., 1987). Learners with high levels of intrinsic motivation should be encouraged to set their own goals, particularly long term goals; learners with low levels of intrinsic motivation may require a series of short term goals and/or extrinsic rewards.

Means Strategies

The second category of strategies deals with the means of achieving the goals set up by the first set of prescriptions. This category has been broadened from Csikszentmihalyi's emphasis on individual skill development to also include environmental aspects which help create a supportive, informational context (see table 2).

According to cognitive evaluation theory (Deci & Ryan, 1985; Vallerand, et al., 1987) an informational context is necessary to promote intrinsic motivation. The strategies under M1 deal with approaches toward developing an informative learning environment. These strategies are used to encourage the development of individual initiative, because intrinsic motivation depends upon a perception personal control and a sense of achievement (Reeve, 1992; Burger, 1985).

The M2 strategies address environmental parameters that encourage the development of learners' skill levels. These are based upon Csikszentmihalyi's seventh element of flow (1990) along with Gagné's (1965) emphasis on the identification of prerequisite skills and knowledge as the basis for instructional design. Strategy M2.3 relates to those metacognitive skills derived from the principles of flow theory (Csikszentmihalyi,1990).

Table 2: Means Strategies

M1. Informational Context

M1.1 Create an informational, rather than a controlling, context for the activity.
M1.2 Within the parameters of the activity, encourage self-determination by maximizing personal choice on the selection of goals.
M1.3 Support feelings of autonomy and freedom, and encourage a task-orientation by allowing learners to direct their own practice and to meet their own standards of excellence.

M2. Skills

M2.1 Construct activities that allow for the development of skills that reduce the margin of error.
M2.2 Teach and practice all necessary pre-requisite skills.
M2.3 Encourage learners to monitor their own feelings of anxiety, apathy and boredom, and to use these feelings as feedback for adjusting the challenge level of the activity.

Feedback Strategies

The strategies dealing with feedback under section F1 are intended to be general heuristics dealing with the overall feedback function (see table 3). Strategies F1.3 through F1.5 are based upon recommendations made by Vallerand et al. (1987). The recommendation on the use of extrinsic rewards for low initial intrinsic motivation is from Reeve (1992).

Positive verbal feedback, if it is used in a context of self-determination, can enhance perceived competence, while negative feedback often decreases competence if it is perceived in a controlling manner. These recommendations are derived from Deci & Ryan (1985).

The concept of naturally occurring feedback, and the two specific forms of it recommended in strategies F3.2 and F3.3, are again based upon Deci & Ryan (1985).

The prescriptions on both direct and indirect competition are also from Deci & Ryan, (1985). It should be noted that all forms of competition should be used carefully. Direct competition should be used only for extrinsic purposes, if at all, as it tends to have a de-motivating effect on those who persistently lose.

Application

Some instructional strategies which seem to naturally incorporate some of these prescriptions include hypermedia applications, simulations and games, and adaptive instructional systems.

A high level of self-determination and personal choice is a key feature of hypermedia systems, and in terms of intrinsic motivation, it is their strongest characteristic. Of the various types of applications being reviewed, hypermedia provides the greatest amount of choice, however, these systems also require the users to set their own goals and define their own feedback. The only goal inherent in these systems is the search and retrieval of information. Their use in a broader educational context requires that goals be defined either by the teacher or by the learner. The same problem can be seen in relation to the feedback function, which consists largely of answering the question "Did I find the information I was seeking?". However, the exploratory nature of most hypermedia systems allow learners to seek out increasingly difficult levels of material. When used appropriately, these systems can provide a challenge which is optimal in nature.

Table 3: Feedback Strategies

F1. General

F1.1 Feedback should be concrete, immediate, and logically related to the goal.

F1.2 Utilize feedback for informational, rather than controlling purposes.

F1.3 Offer feedback and advice, but don't impose it.

F1.4 Create appropriate pacing of feedback for each individual.

F1.5 Provide a supportive context by de-emphasizing pressure to perform or compete.

F1.6 Utilize extrinsic rewards only if there is low initial intrinsic

motivation.

F2. Verbal Feedback

F2.1 Utilize creditable and informative verbal feedback to promote the perception of competence.

F2.2 Avoid negative verbal feedback which can be perceived as a judgement of incompetence.

F3. Naturally Occurring Feedback

F3.1 Design activities that incorporate feedback which is naturally obtained during the process of achieving the goal.

F3.2 Utilize self-evaluation feedback whenever possible.

F3.3 When concentrating on pre-requisite skills, compare performance against a standard.

F4. Competition

F4.1 Utilize indirect competition if it can be perceived as being informational.

F4.2 Avoid the use of direct competition if it is perceived as controlling.

Games and simulation incorporate to a great degree the principles of intrinsic motivation. By their very nature, games and simulations require a clearly defined goal, and the rules for play or operation must be clearly defined. The challenge inherent in a game or simulation can be made optimal by merely changing the variables or the rules to make the activity more difficult as play progresses.

Skill development within the simulation game is provide by practice and strategy development. There is often a high degree of self-determination and personal choice within the boundaries of the activity, with a strong orientation toward the task, that is, the desire to win the game.

Feedback from a simulation game is almost always concrete and immediate, and is always naturally occurring within the context of the activity. There is also a strong element of competition, which can be both direct and indirect in nature. This helps create an atmosphere that is informative in nature, in which performance is evaluated directly in terms of the task.

However, for educational purposes, games and simulations must be integrated into a course with supporting instruction both prior to and after the activity. Standing alone, they may provide entertainment, but they do not ensure the the acquisition of specific knowledge or skill.

Adaptive Instructional Systems hold out much promise in their ability to incorporate the principles of intrinsic motivation into instruction. As can be seen from the research reviewed, intrinsic motivation depends upon a fine balance between clearly defining and structuring the learning activity and allowing the learner a high degree of self-determination and personal choice.

The purpose of an adaptive system is to adapt the style, sequence or content of the instruction to the learners' individual differences. These differences include aptitude, prior

knowledge, cognitive styles, and personality characteristics, such as motivation, levels of anxiety, locus of control and risk taking. Research has shown that aptitude, particularly intelligence, and prior knowledge are the two strongest predictors of performance in instruction. Among personality characteristics, motivation is the difference that most affects learning (Jonassen, 1988; Carrier & Jonassen, 1988).

An adaptive system that could accurately adjust the difficulty level of the instruction for a particular learner as they were using it would be able to maintain an optimal level of challenge. The degree of flow experienced by a learner could be maximized in a system which queried the emotional state of a learner during use (i.e. whether a user felt bored, anxious, etc.), or which analyzed and used content-centered responses to gain information about the user's motivational state. This information could then be used by the system as the basis for further adapting the instruction.

Conclusion

It should also be noted that these prescriptions are preliminary and require further research and development. A process of expert review, brainstorming, and refinement of strategies, as recommended by Keller (1987a), should be employed to further extend this model. In addition, the author is currently conducting a research study to gather empirical evidence in support of these prescriptions.

The significance of this approach is that it attempts to begin an investigation into an aspect of education and training which is critical but often neglected. Motivation, it can be argued, is one of the most important factors in education. A highly motivated student will strive to overcome many limitations in order to achieve his or her goals. An unmotivated student, however, will achieve little in even the most resource rich environment. Initial motivation of an individual towards a topic depends upon many personal and psychological factors. However, continued engagement in the topic can depend, to a large extent, on how that activity is structured. Flow theory identifies those structural variables which can be manipulated by an instructional designer to increase the likelihood that a learner will be motivated on an intrinsic level.

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